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Stress testing the UK banking system: key elements of the 2019 annual cyclical scenario

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Stress testing the UK banking system: key elements of the 2019 annual cyclical scenario

Executive summary

The Bank of England's 2019 annual cyclical scenario (ACS) will test the resilience of the UK banking system to deep simultaneous recessions in the UK and global economies, a financial market stress, and an independent stress of misconduct costs.

By using the test to determine how much capital UK banks could need in such a scenario, the Bank aims to ensure they are able to continue to lend to households and businesses in bad times as well as good.

The Financial Policy Committee (FPC) and the Prudential Regulation Committee (PRC) judge the stress scenario to be appropriate in light of the FPC's assessment of the current underlying vulnerabilities in the UK and global economies and in financial markets.

Reflecting the FPC's assessment that the underlying vulnerabilities are broadly unchanged on the year, the stress-test scenario is very close to that in the 2018 ACS. As such, it remains tougher than the financial crisis. The FPC and PRC will use the test to assess bank balance sheets, and the resilience of the financial system.

In line with the FPC's overall risk assessment, the aggregate severity of the domestic downturn is broadly the same as in the 2018 test. And the FPC has separately judged the system to be resilient to a worst case disorderly Brexit outcome. In a worst case disorderly Brexit, supply would contract by more than in the ACS, generating a larger fall in GDP but a smaller rise in unemployment. Overall, the FPC judges the UK economic scenario in the 2019 ACS and the worst case disorderly Brexit scenario to be of similar severity.

The test scenario continues to reflect the UK's underlying vulnerability to a reduction in foreign investor appetite. In the scenario, a UK-specific risk premium shock drives sharp falls in UK asset prices and a 30% depreciation in sterling, to trough at £0.91 against the US dollar. Consistent with the aim of the scenario to reflect low probability — 'tail risk' — events, the sharp increase in inflation that results from the depreciation is assumed to affect inflation expectations and wage growth, creating a challenging trade-off between growth and inflation. This means that, to return inflation to the 2% target, Bank Rate rises in the scenario to 4%.

The global recession in the 2019 ACS reflects the FPC's continued judgements that, after a rapid increase in debt, the underlying vulnerabilities in China are elevated, and that there are material vulnerabilities in the US, where leverage in the corporate sector has increased, and in the euro area, where there are pockets of high public debt levels and interlinkages between banks and sovereigns. The global scenario is, overall, very slightly more severe than in the 2018 test.

The hurdle rate framework for the 2019 ACS will be broadly similar to that used in the 2018 test. As set out in the November 2018 *Financial Stability Report*, however, the Bank is working on an enduring method to take account of the impact of International Financial Reporting Standard 9 (IFRS 9).

The results of the 2019 ACS will be published in 2019 Q4, along with the Bank's *Financial Stability Report*.

The FPC and PRC agreed that from 2020, the ACS will assess the ring-fenced subgroups of existing ACS participant banks on a standalone basis. In addition, the PRC agreed that unless there is a material change to the group's balance sheet by its year-end at end-September 2019, CYBG will take part in the 2020 stress test for the first time.

Background

The Bank of England's (hereafter 'the Bank') annual stress test examines the potential impact of a hypothetical adverse scenario on the resilience of the banking system and individual institutions within it.(1)

In 2019, the Bank will launch two stress tests. Details of the first, the annual cyclical scenario (ACS), which is used to help determine the appropriate level of capital banks should have, are set out in this document. This will be the fourth ACS the Bank has conducted. As announced previously, the Bank intends to run a second test, the biennial exploratory scenario, scheduled to be launched in October 2019.

Pages 4 to 9 provide a summary of the 2019 ACS as well as setting out further details of the domestic and global risk assessments underpinning its calibration. Pages 10 to 11 cover the ACS hurdle rate framework and policy responses. Page 11 provides further detail of the baseline scenario while pages 12 to 14 describe the important aspects of the 2019 macroeconomic stress scenario in more detail.

Further background on the Bank's current approach to stress testing, detailed guidance for stress-test participants, along with the projections data underlying the 2019 baseline and stress scenarios can be found on the Bank of England website.

Key features of the 2019 annual cyclical scenario

The Bank's 2019 stress scenario and guidance have been produced by Bank staff, under the guidance of the Financial Policy Committee (FPC) and the Prudential Regulation Committee (PRC). The FPC and the PRC judge the stress scenario to be appropriate given the FPC's assessment of the current risk environment.

Banks participating in the ACS

The seven banks and building societies (hereafter 'banks') taking part in the 2019 ACS account for the vast majority of lending to the UK real economy.(2) These banks have a diverse range of business models and some operate in a broad range of international markets.

From 2020, the Bank will include the ring-fenced bank subgroups of the existing stress-test participants in the ACS. This is in addition to the banking groups of these participants, incorporating both ring-fenced and non ring-fenced entities. Also, the PRC agreed that unless there is a material change to the group's balance sheet by its year-end at end-September 2019, CYBG will take part in the 2020 stress test for the first time.(3)

Summary of the stress-test scenario

The stress applied under the ACS is not a forecast. Rather, it is a coherent 'tail risk' scenario designed to be severe and broad enough to assess the resilience of UK banks to a range of adverse shocks.

In common with previous exercises, the 2019 ACS contains three types of severe stress, which are assumed to be synchronised:

- A UK and global macroeconomic stress, spanning a five-year period to the end of 2023.
- A traded risk stress, linked to a financial market scenario consistent with the content and calibration of the macroeconomic stress.
- A misconduct costs stress.

The synchronised global shocks in the scenario result in a global recession, with world GDP growth falling by more than in the financial crisis.

Financial market participants attempt to de-risk their portfolios, generating substantial increases in volatility and risk premia in financial markets and some safe-haven capital flows. Emerging market currencies depreciate against the US dollar and asset prices, including on property, fall sharply. Falls in Chinese and Hong Kong property prices are particularly pronounced.

UK domestic demand falls and investor appetite for UK assets diminishes. The shortfall in domestic demand is exacerbated by spillovers to the UK economy from the global shock.

As the Bank's recent *Financial Stability Reports* have highlighted, the United Kingdom's large current account deficit makes it reliant on cross-border capital flows, leaving the UK economy vulnerable to a reduction in foreign investor appetite for UK assets.

The assumed reduction in appetite for sterling assets results in a sharp rise in funding costs for the UK economy, a further slowdown in demand and a sharp fall in the sterling exchange rate. The sterling exchange rate index falls by 28% from its 2018 Q4 level. The sterling/US dollar exchange rate falls by 30%.

(1) Unless otherwise stated, references to the Bank of England throughout this document include the Prudential Regulation Authority.
(2) The seven participating banks and building societies are: Barclays, HSBC, Lloyds Banking Group, Nationwide, The Royal Bank of Scotland Group, Santander UK Group Holdings plc and Standard Chartered.
(3) CYBG plc acquired Virgin Money Holdings (UK) plc in October 2018. The group now includes Clydesdale Bank plc and Virgin Money plc, alongside the additional brands of Yorkshire Bank, and digital brand B.

As higher import prices feed through to UK inflation and inflation expectations rise, monetary policy responds and Bank Rate increases to 4%. Gilt yields also rise and banks face material increases in their wholesale and retail funding costs.

A sharp fall in UK residential property prices is assumed to be particularly concentrated in regions that have experienced more rapid price increases over recent years. Likewise a fall in UK commercial real estate (CRE) prices is concentrated in the prime sector of the market.

The combined impact of increases in interest rates, the contraction of world demand, falls in asset prices and heightened uncertainty have a pronounced impact on domestic growth and unemployment over the first two years of the scenario. Productivity growth is lower on average over the stress, which limits the pace of the recovery in the latter part of the scenario. Related to those developments, the demand for credit from UK households and businesses falls.

How changes in the FPC's risk assessment have impacted the stress scenario

The stress scenario has been updated to take account of developments in the domestic and global economies over the past year.[4]

Under the ACS framework, the sizes of the shocks to different sectors and economies are adjusted each year to deliver a similar stressed outcome, unless the FPC's assessment of underlying vulnerabilities suggests a stress could be more or less severe than previously factored in. However, the severity of the stress scenario is not affected by assessments around the likelihood of a stress occurring in the near term.

Adjusting the stress scenario in this systematic way should mean that the impact of the stress on banks' capital and leverage ratios increases when risks are judged to have risen and decreases as risks crystallise or abate. This makes the ACS useful for the FPC in its assessment of the appropriate setting for the UK countercyclical capital buffer (CCyB) rate.

Further details of how the ACS framework has been applied to update the stress scenario this year are set out below and in **Table A**.

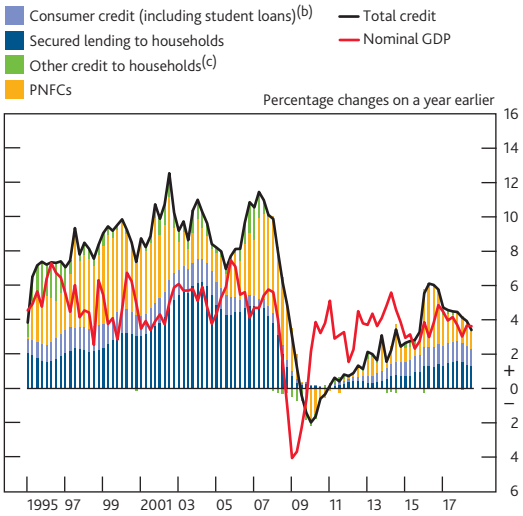
Underlying domestic vulnerabilities are broadly unchanged over the past year…

Overall, domestic vulnerabilities, apart from those related to Brexit, remain at a standard level.

Debt burdens — and how rapidly they are growing — are important inputs into the FPC's assessment of underlying vulnerabilities because high debt burdens and credit booms tend to be associated with more severe stresses.[5] In the past year, UK credit growth has slowed (**Chart 1**), though levels of household and corporate debt remain high by historical standards. For example, gross UK corporate debt (excluding CRE) as a share of earnings stands at more than 300% — higher than in the run-up to the financial crisis. However, ongoing low interest rates have also helped ensure that interest burdens for households and businesses are low.

Chart 1 Domestic credit growth has slowed recently

Growth in UK credit and nominal GDP[a]



Sources: Office for National Statistics and Bank calculations.

(a) Credit is defined as debt claims on the UK private non-financial sector. This includes all liabilities of households and non-profit institutions serving households (NPISH), except for unfunded pension liabilities and financial derivatives associated with NPISH. Also contains private non-financial corporations' (PNFCs') loans and debt securities, excluding direct investment loans and loans secured on dwellings. Data are all currency and are not seasonally adjusted.
(b) Includes student loans. As student loans are only available annually on a financial-year basis, periods after 2018 Q1 are estimated as total unsecured loans to households and NPISH, less monetary financial institutions' (MFIs') sterling loans to unincorporated businesses and the not-for-profit sector component.
(c) Calculated as the residual of total credit to households and NPISH, less secured and unsecured loans to individuals. The residual comprises of MFI loans to unincorporated businesses (for example sole traders), loans to NPISH and household bills that are due but not yet paid.

…but global vulnerabilities have risen slightly.

The FPC judges that underlying vulnerabilities in the global economy have increased slightly, since the 2018 ACS was launched in 2018 Q1.

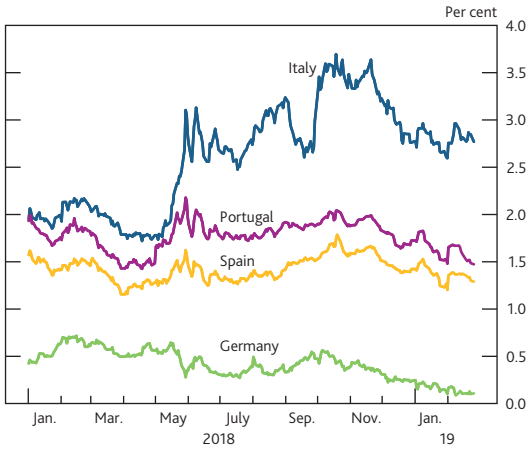
In the euro area, political developments in Italy have reinforced the vulnerabilities created by high public sector debt and interlinkages between banks and sovereigns in a currency union (**Chart 2**).

In the United States, private sector debt has increased relative to GDP. Underwriting standards have also loosened. The recent growth in leveraged lending to higher debt companies has contributed to a pickup in aggregate corporate leverage (**Chart 3**), with debt as a proportion of EBITDA[6] increasing. And fiscal space in the US is more constrained.

(4) For more details of the risk assessment underpinning the 2019 ACS see 'Financial Policy Summary and Record of the FPC meeting' on 26 February 2019.
(5) For more information see Bridges, J, Jackson, C and McGregor, D (2017), 'Down in the slumps: the role of credit in five decades of recessions', *Bank of England Staff Working Paper No. 659*.
(6) Earnings before interest, tax, depreciation and amortisation.

Chart 2 Italian government bond yields rose during 2018 in response to political developments

Ten-year government bond yields[a][b]

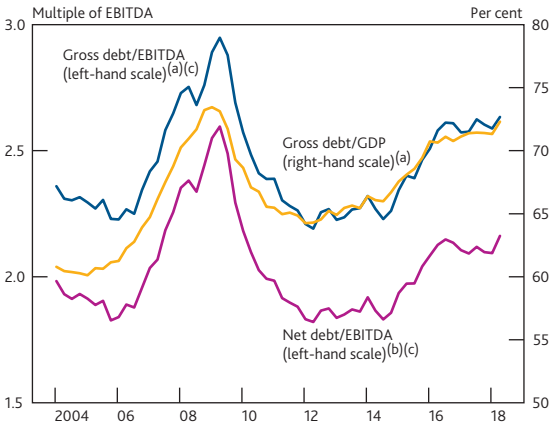


Source: Eikon from Refinitiv.

(a) Data taken from benchmark bonds.
(b) Data up to 25 February 2019.

Chart 3 US corporates are becoming increasingly indebted

US corporate indebtedness



Sources: Eikon from Refinitiv, Federal Reserve Board, 'Financial Accounts of the United States' and US Bureau of Economic Analysis.

(a) Gross debt equals total company debt liabilities minus holding company loan assets.
(b) Net debt is gross debt minus currency and deposit assets.
(c) Income refers to companies' gross operating surplus.

In China, debt levels have risen no faster than nominal GDP in the past year as policies enacted to reduce risks in the financial system have weighed on credit growth. The FPC agrees that recent changes in China's economic outlook have not affected the underlying vulnerability to a future shock. The FPC's assessment of the underlying vulnerability in China and Hong Kong is therefore unchanged, at 'elevated', reflecting the rapid build-up in debt prior to 2018.

Nevertheless, a high level of whole-economy debt could point to a more difficult recovery from a stress. This might render a downturn in China more prolonged.[7]

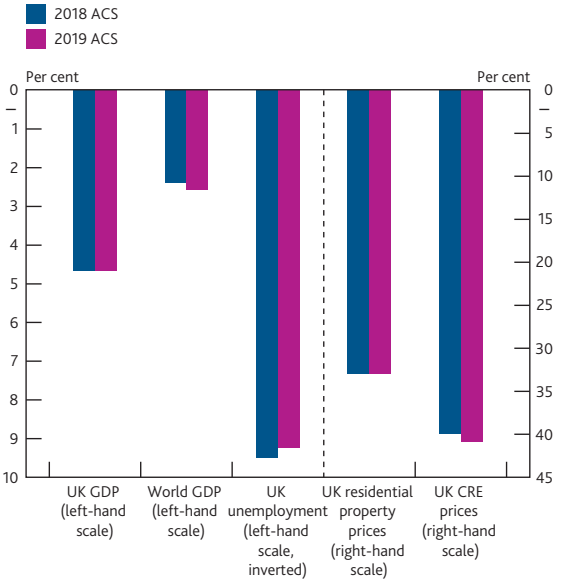
This assessment of risks is then reflected in the 2019 ACS calibration.

The calibration of the global elements of the 2019 ACS reflects the judgement of the FPC that global risks have increased slightly over the past year, since the 2018 ACS was launched, while domestic risks are broadly unchanged. This means that:

- The start-to-trough fall in global GDP is -2.6% in the 2019 ACS, larger than the -2.4% fall in the 2018 exercise (**Chart 4**).

Chart 4 The UK macroeconomic shock is similar to last year's test, while the global stress is very slightly more severe

Start-to-trough falls in key variables in the 2018 and 2019 ACS[a]



Source: Bank calculations.

(a) Unemployment is the peak level.

- US and euro-area GDP fall by -3.7% and -4.0% respectively; shocks that are 0.2 percentage points and 0.4 percentage points larger than in the 2018 ACS (**Chart 5**).

- The fall in Chinese GDP (-1.2%) is the same as in the 2018 ACS (**Chart 5**), but growth does not recover to the same rate as in the 2018 ACS.

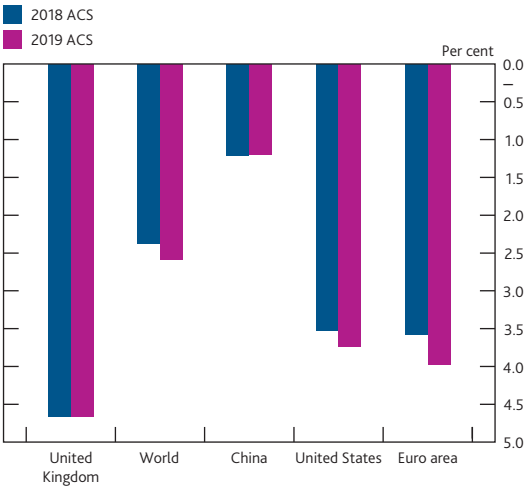
- UK GDP falls by 4.7%, the same as in the 2018 test (**Chart 4**).

The stressed levels of asset prices also reflect these judgements.

(7) See Carney, M (2019), 'The global outlook'.

Chart 5 The fall in UK GDP is the same as in the 2018 ACS but world GDP falls by slightly more

Start-to-trough fall in GDP in the 2018 and 2019 ACS



Source: Bank calculations.

For example, given the judgement that underlying vulnerabilities in the UK are unchanged, residential and commercial property prices fall to the same level, relative to equilibria, as in the 2018 test. And because residential prices have risen in line with estimates of equilibrium (for example, prices have risen in line with incomes) over the past year, the fall in residential property prices incorporated into the 2019 ACS is same as in the 2018 test (-33%). In contrast, commercial real estate prices have risen slightly relative to estimates of equilibrium (for example by rising more than rents), so the fall in UK CRE prices is a little larger in this year's test (-41% versus -40% in the 2018 ACS).

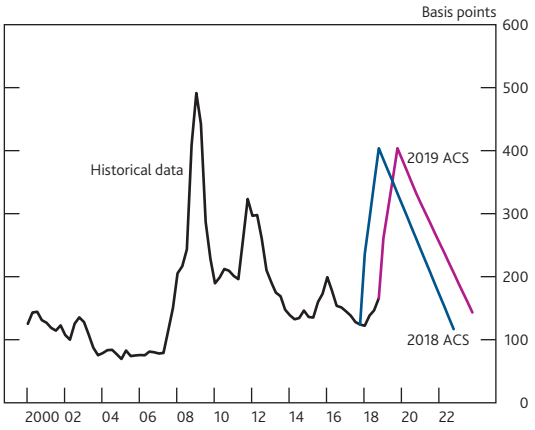
Sterling investment-grade and high-yield corporate bond spreads peak at the same levels as in the 2018 ACS: around 400 basis points and 1,950 basis points respectively. But because they start from a higher level than in the 2018 test, they rise by less than they did in that exercise (**Chart 6**).

Reflecting the judgement that underlying vulnerabilities in the US have increased, US asset prices trough at a lower level. For example, US dollar investment-grade corporate bond prices fall by more, so spreads peak at a higher level. But as they also start from a higher level than in the 2018 test — because spreads have widened in the interim — they rise by a similar amount in the 2019 ACS (**Chart 7**).

Underlying vulnerabilities in Hong Kong and China are judged to be unchanged, so, for example, the stressed level of Hong Kong residential property prices relative to equilibrium, is the same as in the 2018 ACS. However, because prices have risen, relative to estimates of equilibrium, during 2018, the fall in Hong Kong residential property prices is larger in the 2019 ACS (-55% compared with -50% in the 2018 ACS).

Chart 6 The widening in sterling investment-grade corporate bond spreads is slightly smaller in this year's test

Sterling investment-grade corporate bond spreads in the 2018 and 2019 ACS[(a)]

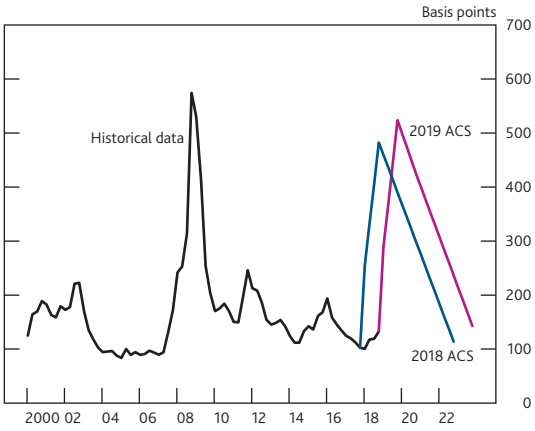


Sources: ICE/BoAML Global Research and Bank calculations.

(a) Quarterly average option adjusted spread over maturity-matched government spot curve on GBP denominated investment-grade corporate debt publicly issued in the eurobond or UK domestic market.

Chart 7 US dollar investment-grade corporate bond spreads peak at a higher level than in the 2018 ACS

US dollar investment-grade corporate bond spreads in the 2018 and 2019 ACS[(a)]



Sources: ICE/BoAML Global Research and Bank calculations.

(a) Quarterly average option adjusted spread over maturity-matched government spot curve on US dollar denominated investment-grade corporate debt publicly issued in the US market.

Details of how developments since the launch of the 2018 ACS have affected the calibration of the 2019 scenario are summarised in **Table A**.

The stress test encompasses the risks of a worst case disorderly Brexit scenario.

The macroeconomic scenario is more severe overall than the global financial crisis (**Table B**).

In 2018, the FPC judged that the UK economic scenario in the 2018 ACS was sufficiently severe to encompass the outcomes based on 'worst case' assumptions about the challenges the UK economy could face in the event of a disorderly Brexit. In a worst case disorderly Brexit, supply would contract by more than in the ACS, generating a larger fall in GDP but a smaller

Table A Developments since the launch of the 2018 ACS and impact on the calibration of the 2019 ACS[a]

Variable	Developments since 2018 Q1	Stress 2019 ACS	Stress 2018 ACS
		(per cent change, unless otherwise stated)	
Global activity			
World GDP	Global vulnerabilities have risen slightly	-2.6	-2.4
US GDP	Corporate indebtedness has increased alongside deteriorating credit quality and a loosening of underwriting standards	-3.7	-3.5
Euro-area GDP	Political developments in Italy have reinforced the vulnerabilities created by high public sector debt and interlinkages between banks and sovereigns in a currency union	-4.0	-3.6
Financial and commodity markets			
UK equities	Equity prices have declined and valuations have become less stretched	-41	-45
UK high-yield corporate bond spreads	Spreads have widened and overall UK risk environment is unchanged	1,418 (basis point rise)	1,603 (basis point rise)
US investment-grade corporate bond spreads	Spreads have widened but overall US vulnerabilities have risen	391 (basis point rise)	380 (basis point rise)
Oil price	Global vulnerabilities have risen slightly	-39 (fall in US$ price per barrel)	-32 (fall in US$ price per barrel)
Domestic asset prices			
UK residential property prices	Prices have grown in line with estimates of equilibrium	-33	-33
UK CRE prices	Prices have risen slightly relative to estimates of equilibrium	-41	-40
Domestic activity			
UK GDP	Domestic vulnerabilities are broadly unchanged	-4.7	-4.7
UK unemployment rate	Domestic vulnerabilities are broadly unchanged and the MPC's revised estimate of the equilibrium rate of unemployment is included	9.2% (peak level)	9.5% (peak level)

(a) Selected variables only. For more information see 'Variable paths for the 2019 stress test'.

rise in unemployment. Overall the FPC judged the macroeconomic severity of the two scenarios to be similar.(8)

Table B The stress scenario is more severe overall than the global financial crisis

Peak-to-trough falls in key variables

Per cent

	2019 ACS	2018 ACS	Financial crisis
UK real GDP	-4.7	-4.7	-6.3
World real GDP[a]	-2.6	-2.4	-1.2
UK unemployment (peak level)	9.2	9.5	8.4
UK residential property prices[b]	-33	-33	-17
UK commercial real estate prices	-41	-40	-42

Sources: Halifax/Markit, IMF *World Economic Outlook*, MSCI Investment Property Databank, Nationwide, ONS and Bank calculations.

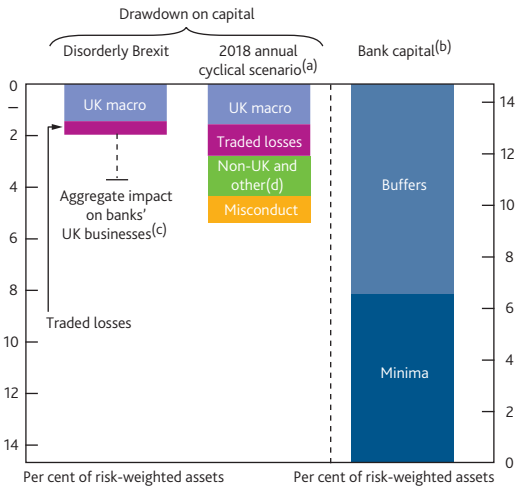
(a) Figures for world GDP are the trough four-quarter growth rate.
(b) Financial crisis data are a combination of the quarterly Halifax/Markit and Nationwide house price indices.

In light of the results of the 2018 stress test and analysis on the risks from a disorderly Brexit, the FPC judged that the major UK banks would be resilient to a worst case disorderly Brexit scenario in which there is: a sudden imposition of trade barriers with the EU; loss of existing trade agreements with other countries; severe customs disruption; a sharp increase in the risk premium on UK assets; and negative spillovers to wider UK financial markets (**Chart 8**).

(8) For further details see 'EU withdrawal scenarios and monetary and financial stability: A response to the House of Commons Treasury Committee', Bank of England, November 2018.

Chart 8 In 2018 the FPC judged the UK banking system was strong enough to withstand the economic shocks that would accompany a worst case disorderly Brexit

Comparison of the impact of the worst case disorderly Brexit scenario and 2018 ACS on major UK banks' capital ratios



Sources: Participating banks' Stress Testing Data Framework data submissions, PRA regulatory returns, published accounts, Bank analysis and calculations.

(a) The CET1 impact for the ACS is before the conversion of additional Tier 1 instruments.
(b) Defined as total aggregate CET1 capital as a proportion of risk-weighted assets (RWAs), as of 2018 Q3.
(c) Average impact on banks' UK businesses calculated by scaling the aggregate impact of the disorderly Brexit scenario based on groups' aggregate ratio of global to UK business. This estimates the impact of the scenario as a proportion of groups' aggregate UK RWAs.
(d) Non-UK is computed as a residual in this chart. It includes global elements in the same category as the UK macroeconomic impact.

Given that the severity of the domestic scenario remains largely unchanged, relative to the 2018 ACS, the FPC judges that the scenario for the UK in the 2019 stress test would also encompass the severity of a worst case disorderly Brexit.

The calibration of the traded risk scenario reflects developments in financial markets as well as the macroeconomic scenario.
The 2019 ACS includes a traded risk scenario that has been designed to be consistent with the macroeconomic scenario and to take account of the liquidity of trading book positions. This element of the ACS will principally impact the investment banking operations of UK banks.

The traded risk component of the 2019 ACS requires banks to apply a price shock to their market risk positions as of 15 February 2019.(9) The Bank's approach to traded risk takes account of different liquidity horizons by imposing larger shocks on positions that banks would take longer to close out, and smaller shocks for those positions that could be sold or hedged within shorter time frames.

The 2019 traded risk scenario will capture the main risks to stress-test participants from leveraged lending (see 'Traded risk scenario for the 2019 stress test' for further details). The leveraged loan index price shocks included in the scenario are slightly more severe than those seen during the global financial crisis, reflecting deterioration in lending standards over recent years.

The test will also examine the ability of banks to withstand the default of seven counterparties that would be vulnerable to the macroeconomic scenario — five uncollateralised and two collateralised.(10) In determining the counterparties to default, banks are instructed to consider both the current creditworthiness of their counterparties, and how that creditworthiness might deteriorate under the stress scenario.

In addition to examining the impact of the default of specific counterparties, the scenario will test the broader portfolio impact from a portion of counterparties that are below a certain rating, and that are vulnerable under the stress scenario. The test also includes stressed revenue and costs projections for investment banking activities.

Banks will be assessed against stressed misconduct costs beyond those already paid or provisioned for.
There remains a very high degree of uncertainty around any approach to quantifying misconduct cost risks facing UK banks. For the 2019 test, the Bank is using the same methodology as that applied in previous tests. That means the test will incorporate stressed projections for potential misconduct fines and other costs beyond those paid or provided for by the end of 2018. Banks are asked to provide stressed projections for misconduct costs that relate to known misconduct issues and have a low likelihood of being exceeded.

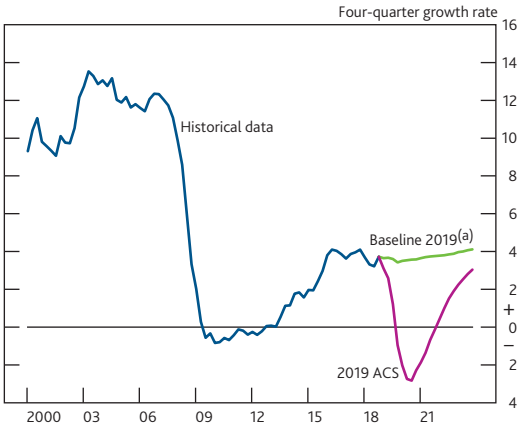
UK lending in the stress

In line with the approach taken in previous stress tests carried out by the Bank, the 2019 ACS is calibrated on the assumption that banks satisfy the demand for credit from UK households and businesses throughout the stress scenario. That is, banks are assumed not to reduce the supply of credit, although rises in bank funding costs are passed through to borrowers. The Bank has published paths for aggregate lending to UK households and private non-financial corporations (PNFCs) based on that assumption. Stress-test participants will be expected to submit projections for lending under the stress which are consistent with those aggregate paths.

Over the five years of the stress scenario, lending to the UK real economy increases by around 1.5% in total. Credit demand contracts over the first two years of the stress, before recovering thereafter as economic activity increases and Bank Rate and bank funding costs decline somewhat towards the end of the scenario (**Chart 9**).

Chart 9 Participating banks are required to meet the demand for credit from UK households and businesses in the stress

Net lending to UK individuals and PNFCs in the 2019 ACS



Sources: Bank of England and Bank calculations.

(a) The baseline scenario is designed to be broadly consistent with the forecasts published in the February 2019 *Inflation Report*.

Qualitative review

An important objective of the Bank's concurrent stress-testing framework is to support a continued improvement in banks' own risk management and capital planning capabilities. For this reason, as in previous years, the Bank will undertake a qualitative review of banks' stress-testing capabilities as part of the 2019 ACS.

(9) For more details see 'Stress testing the UK banking system: 2019 guidance for participating banks and building societies' and the 2019 'Traded risk scenario'.
(10) Banks should select two uncollateralised counterparties to default of their top-10 Asia and emerging-economy exposures, and one from each of their top-10 UK, US and euro-area uncollateralised exposures. Banks should default two of their top-30 collateralised global counterparties.

The 2015 Stress Testing Approach document indicated that, in future, more detail might be published of the Bank's observations on strong and weak practice arising from the qualitative review. As noted in the November 2018 *Financial Stability Report*, the PRC is minded to include reference to qualitative review outcomes in this year's publication of bank-specific assessments.

Hurdle rate

The hurdle rate framework will be the similar to that used in the 2018 test.

A key determinant of whether a bank may be required to take action to strengthen its capital position in light of the ACS results is where its capital ratio falls to in the stress, relative to the level of capital banks are expected to maintain. This level is known as the 'hurdle rate'. The hurdle rate framework for the 2019 ACS is broadly similar to that used in the 2018 test, comprising elements expressed both in terms of risk-weighted common equity Tier 1 (CET1) capital and Tier 1 leverage ratios. However, the approach to incorporating the impact of accounting standard International Financial Reporting Standard 9 (IFRS 9) into banks' hurdle rates is currently under review.

In line with the approach taken in the 2018 test, the **CET1 hurdle rate** against which participating banks will be assessed will be comprised of:

(1) Each bank's minimum CET1 capital requirements: that is the sum of the internationally agreed Pillar 1 common minimum standard of 4.5% of risk-weighted assets (RWAs), as well as any uplift to that minimum requirement set by the Prudential Regulation Authority, ie Pillar 2A.

(2) Any systemic buffers that a global or domestic systemically important bank is required to hold. This includes the systemic risk buffer (SRB), which was introduced in January 2019 and which applies to ring-fenced banks and systemic building societies.

The hurdle rate framework will continue to take a dynamic approach for the calculation of banks' Pillar 2A capital requirements through the course of the stress. This will allow the test to reflect the way Pillar 2A would evolve in a real stress.

In the 2018 ACS, the Bank also adjusted the hurdle rates of participating banks to take account of the impact of IFRS 9. In line with the approach set out in the November 2018 *Financial Stability Report*, the Bank will seek views on an enduring treatment for IFRS 9 in the stress test.

As in previous years, participating banks will also be assessed against a **Tier 1 leverage ratio** hurdle rate. The leverage ratio hurdle rate for the 2019 ACS will incorporate the 3.25% minimum leverage ratio and additional leverage ratio buffers that reflect banks' systemic importance — including for ring-fenced banks and systemic building societies subject to an SRB to reflect their domestic systemic importance.

Tier 1 leverage hurdle rates will also be adjusted to take account of the impact of IFRS 9.

Further details of the existing hurdle rate framework can be found in the November 2018 *Financial Stability Report*.

Policy responses

The FPC and PRC will consider how banks perform in the test to determine if any actions are required.

Banks that fall below their hurdle rate will generally be required to take action to strengthen their capital position, if they have not already done so.

If a bank's capital ratio was projected to remain above its hurdle rate, the PRC may still require it to take action to strengthen its capital position. Examples of factors the PRC might take into consideration in deciding whether action is needed include but are not limited to: the bank's Tier 1 and total capital ratios under stress; the extent to which the bank had used up its capital conservation buffer in the stress; and the adequacy and quality of its recovery and resolution plans.

The stress-test results, and other relevant information, are used by the FPC and PRC to co-ordinate their policy responses to ensure the banking system as a whole, and individual banks within it, maintain sufficient capital to absorb losses and continue to supply credit to households and businesses even in a stress. They can do so by adjusting capital buffers, namely the system-wide UK countercyclical capital buffer (CCyB) and the bank-specific PRA buffer.

When the FPC sets the UK CCyB rate it takes into account its assessment of prevailing conditions as well as the results of the ACS.

After the FPC has set the UK CCyB rate, the PRC considers the capital adequacy of each individual bank. In making these judgements, the PRC considers all available information, including the results of the ACS. It takes account of the level of the system-wide UK CCyB rate implied by the results of the test and, where applicable, how that differs from the UK CCyB rate set by the FPC. In doing so, it avoids inadvertently reducing or increasing the level of system-wide capital buffer set by the FPC.

The PRC also considers any steps banks have taken to strengthen their capital position since the balance sheet cut-off date of the test, as well as banks' risk management and governance capabilities.(11) If the exercise reveals a bank's capital position needs to be strengthened further, the PRC will consider the case for requiring additional capital actions.

Banks will once again be assessed on an IFRS 9 transitional basis. The 2019 ACS will be the second of the Bank's stress tests to be conducted under accounting standard IFRS 9. In line with the approach used in the 2018 test, the Bank will assess participating banks' results taking account of the internationally agreed transitional arrangements, which have been put in place to help banks adapt to the new standard. To ensure transparency, the Bank will also publish each bank's capital and leverage low points on a non-transitional basis.

Publication of results

The results of the 2019 ACS will be published in 2019 Q4 along with the Bank's *Financial Stability Report*. As in previous years, the Bank is committed to disclosing the information necessary to explain the results of the ACS. This will include at least as much bank-specific information about the headline impact of the stress on capital adequacy as in previous tests.

2019 baseline macroeconomic scenario

In addition to the stress scenario, banks are asked to provide projections under a baseline macroeconomic scenario.

As in previous tests, the paths for UK macroeconomic prices and measures of activity in the baseline scenario have been developed by Bank staff and are broadly consistent with the central projections published in the February 2019 *Inflation Report*. Similarly, the international macroeconomic variables are largely consistent with the latest full projections from the International Monetary Fund's (IMF's) *World Economic Outlook*.

In the UK, annual real GDP growth is projected to fall to 1.3% in 2019 before rising to 1.5% in 2020.(12) It then continues to strengthen and averages 1.8% over the five-year baseline scenario as uncertainty wanes. Growth is also supported by looser fiscal policy and stimulus from interest and exchange rates, which more than offsets the projected impact of weaker global activity and tighter financial conditions. The UK unemployment rate remains around 4%, ending the scenario at 3.8%. Annual PPP-weighted world GDP growth averages around 3.6% over the course of the scenario (**Table C**).

Table C The variables in the baseline scenario are broadly consistent with the February 2019 *Inflation Report* and the IMF's *World Economic Outlook*

Summary of key variables in the five-year baseline scenario

Per cent

	Average over five-year baseline
Annual UK real GDP growth	1.8
Annual world real GDP growth[a]	3.6
Annual euro-area real GDP growth	1.5
Annual US real GDP growth	1.7
Annual China real GDP growth	5.9
UK unemployment rate	3.9

Sources: Bank of England, IMF *World Economic Outlook* October 2018 and Bank calculations.

(a) Purchasing power parity (PPP) weighted.

UK inflation falls a little below the target temporarily over much of 2019, largely reflecting the impact of lower oil prices. It then rises back above 2% as that impact unwinds. Sterling's past depreciation continues to put some upward pressure on inflation, although that effect wanes over the course of the baseline. Bank Rate is assumed to rise gradually, reaching 1.2% by the final year of the scenario in 2023.

Residential property prices rise at an average annual rate of 3.6% over the course of the scenario, while UK commercial real estate prices begin to fall in 2019 and only return to weak growth in 2022.

(11) This is in line with the approach to Pillar 2B set out in the PRA Statement of Policy 'The PRA's methodologies for setting Pillar 2 capital', April 2018.
(12) The growth rates in the baseline scenario include the Bank staff backcast for GDP, unlike the headline projection in the Bank's *Inflation Report*.

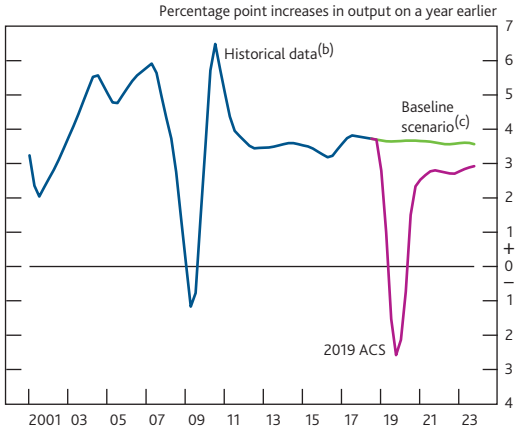
Detailed description of the 2019 macroeconomic stress scenario

This section describes the important aspects of the 2019 macroeconomic stress scenario in more detail. It includes a description of some aspects of the scenario not included in the set of published stress macroeconomic variable paths. This should help guide stress-test participants in generating their own stressed projections for those aspects. As in previous tests, the ACS spans a five-year period. It begins in 2019 Q1 and extends through to 2023 Q4.

The global stress

Global output contracts by 2.6% over the first year of the stress scenario as economies around the world experience severe and synchronised slowdowns (**Chart 10**). The fall in GDP is more severe than that experienced during the financial crisis. The mix of shocks in the stress is slightly different than in the financial crisis, however, with the Chinese economy for example, experiencing a larger downturn. Growth resumes in 2020 and averages 2.8% over the final three years of the stress but remains below the baseline scenario.

Chart 10 World GDP falls by 2.6% in the stress
Annual growth in world real GDP in the 2019 ACS[a]

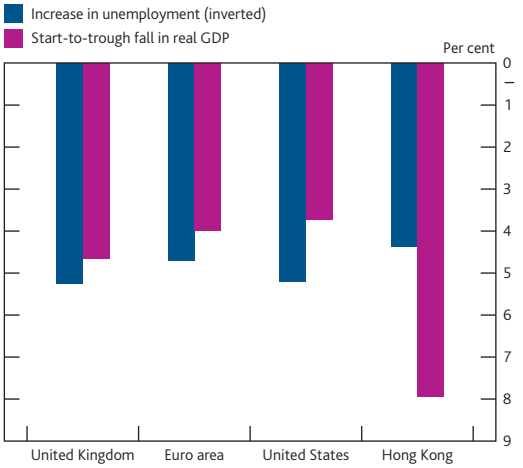


Sources: IMF International Financial Statistics, IMF *WEO* October 2018 and Bank calculations.

(a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.
(b) Historical data until 2018 Q3 are non seasonally adjusted annual growth rates. The 2018 Q4 historical data point is estimated from interpolated annual data.
(c) The baseline projection is consistent with the IMF's projections in the IMF October 2018 *WEO*. Bank staff have interpolated the original series from annual to quarterly.

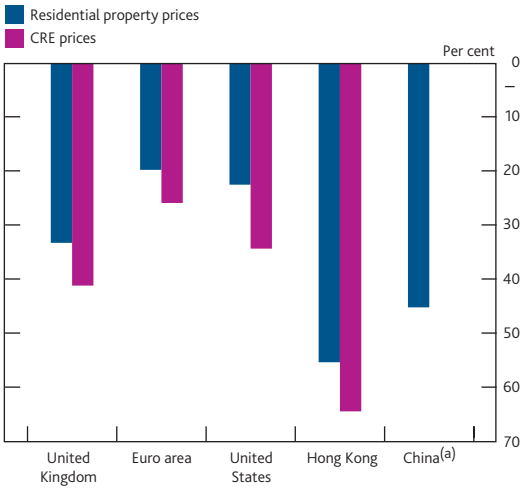
Euro-area GDP contracts by 4.0% in 2019, with growth resuming in late 2020. Euro-area unemployment rises by 4.7 percentage points to peak at 12.6% in 2020, before falling to 11.6% by the end of the scenario (**Chart 11**). Headline euro-area inflation turns negative in 2019, reflecting weaker demand and lower commodity prices, and does not rise above zero until 2021 H1. Core inflation remains weak throughout the scenario.

Chart 11 The UK's largest trading partners experience sharp falls in output and increases in unemployment
Start-to-trough fall in GDP and change in unemployment in the 2019 ACS



Sources: Bank of England and Bank calculations.

Chart 12 The UK's largest trading partners experience severe falls in property prices
Start-to-trough falls in residential and commercial real estate property prices in the 2019 ACS



Sources: Bank of England and Bank calculations.

(a) Due to a lack of reliable historical data, the Bank does not publish a projection for Chinese CRE prices.

Residential property prices fall by 20% across the euro area, while CRE prices fall by 26% in the stress (**Chart 12**). In particular, French CRE prices fall by more than the euro-area average. Aggregate euro-area property prices recover modestly over the final years of the stress.

The European Central Bank is assumed to pursue significant further monetary stimulus under the stress scenario, putting downward pressure on long-term market interest rates.

US GDP contracts by 3.7% during the first year of the stress, while unemployment peaks at 9% in 2020. Thereafter, modest output growth resumes and unemployment falls back.

On a peak-to-trough basis, US residential property prices decrease by 22% in the stress, while CRE prices fall by 34%. Residential property prices recover somewhat over the final years of the stress horizon, ending 16% lower than in 2018 Q4, while CRE prices finish around 24% down.

Overall US corporate profitability falls and the cost of corporate credit rises. Highly leveraged corporates and those involved in the oil and gas extraction industry are among the most severely affected, given the weakness of commodity prices in the stress.

Ten-year US government bond yields rise initially as term premia increase, peaking at just under 3.5%. But as the US Federal Reserve injects monetary stimulus by making further large-scale asset purchases, 10-year government bond yields fall back to under 2.4% by the end of the stress horizon. The US policy rate is also cut from an average of 2.3% in 2018 Q4 to 0.25% by the end of the first year of the stress in 2019.

China's GDP falls by 1.2% in the first year of the stress, before recovering to a growth rate of 4.5% by the end of the scenario. This is somewhat weaker than the average annual growth rates seen in recent years. Over the five years of the stress, the total loss of output, relative to the baseline scenario, is just under 13%.

The contraction in output is accompanied by a fall in residential property prices of 45%. Prices recover almost a third of that fall by the end of the scenario in 2023.

The slowdown in Chinese economic activity is associated with a weakening in household income growth. Nominal Chinese household income growth slows from 7.7% at the end of 2018 to 1.5% by 2020 Q4.

Hong Kong's output, which has been more volatile than China's over recent decades, contracts by almost 8% over the first year of the stress scenario, followed by a very weak recovery. Residential and commercial real estate property prices are assumed to fall by 55% and 64% respectively from peak to trough. These falls are accompanied by a widening of the Hibor-US dollar Libor spread, as the currency peg to the US dollar comes under pressure, though it is assumed that the currency peg holds in the stress.

Hibor peaks at around 5.5% at the start of the stress before falling back to under 2% by the second half of 2021 and to around 0.8% by the end of the five-year scenario. Average Hong Kong bank funding costs follow a similar profile to three-month Hibor in the stress.

Economic activity slows in **Singapore and India** as part of a broad-based downturn in growth across Asia. Singaporean GDP contracts by 7.2% and Indian GDP slows from 7% at the end of 2018 to an annual rate of 1.4% by the end of the first year of the scenario. Actions by authorities support economic recovery from 2019 onwards.

Weak global demand conditions cause commodity prices to fall. Oil prices fall from US$68 per barrel in 2018 Q4 to US$29 per barrel in the stress. They remain at this level until the end of 2020, before rising back to US$50 per barrel by the end of the five-year horizon. Other commodity prices also fall and remain weak throughout the scenario.

The global stress causes financial market participants' perceptions of risk to increase, and their risk appetite to diminish. **Risk premia rise** in a number of markets. Investment-grade US corporate bond spreads increase from just over 130 basis points in 2018 Q4 to more than 520 basis points by 2019 Q4, while high-yield US corporate bond spreads rise from around 410 basis points to 1,640 basis points over the same period. Liquidity conditions deteriorate and liquidity risk premia rise across a number of financial markets.

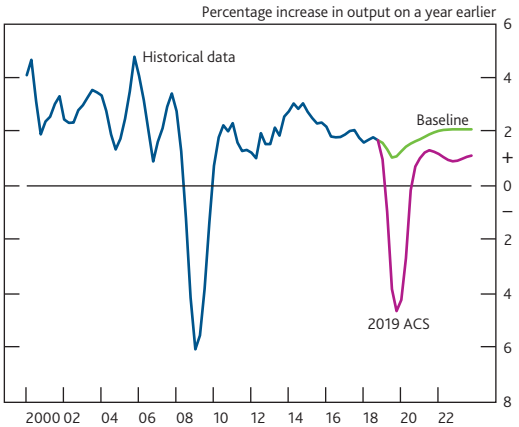
The **US dollar appreciates** as some capital is withdrawn from emerging market economies (EMEs). The US dollar appreciates by 10% against the Chinese renminbi. The US dollar also appreciates by 10% or more against other EME currencies.

Measures of **market volatility** also rise, with the VIX peaking at a quarterly average of 41 during 2019 in the stress.

The domestic stress

UK output contracts by 4.7% over the first year of the scenario (**Chart 13**). Unemployment rises by 5.2 percentage points, peaking at 9.2% in the second year of the stress. While growth returns and unemployment starts to fall back after this, the level of output and the rate of growth remains persistently below the baseline path, as productivity growth is weak.

Chart 13 UK GDP falls by 4.7% in the stress
Annual growth in UK real GDP in the 2019 ACS[(a)]



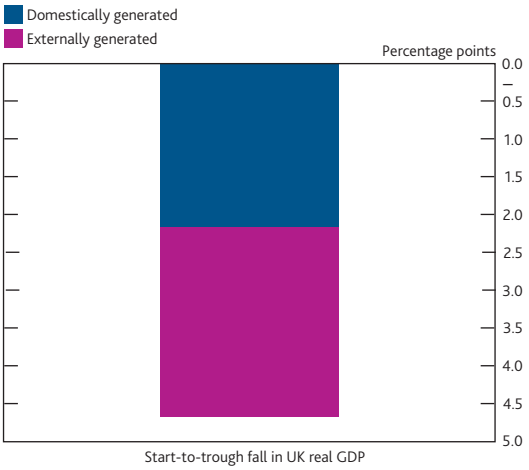
Sources: ONS and Bank calculations.

(a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.

Around half of the fall in UK output is driven by spillover effects from the severe global stress, consistent with the deep trade and financial linkages the UK has with the global economy (**Chart 14**).[13] There is also a **UK-specific risk premium shock**, which is associated with a **large depreciation of sterling**. The sterling exchange rate index (ERI) falls by 28%, with sterling depreciating by a little under 30% against the US dollar. The exchange rate troughs at the beginning of 2020.

Chart 14 A large portion of the UK shock is driven by spillover effects from the global stress

Decomposition of UK GDP stress, by source of shock



Sources: Bank of England and Bank calculations.

UK inflation rises to 4.9% by the start of 2021, pushed up by higher import prices and elevated inflation expectations. The Monetary Policy Committee (MPC) acts to tighten policy, helping to bring inflation back to a little over target in the final year of the scenario.

Bank Rate is assumed to rise to 4% by the end of 2019. After inflation starts falling back towards target over the final two years of the stress, the MPC then begins to reduce Bank Rate, which reaches 3.25% by the end of the scenario. Longer-term interest rates are pushed up by an increase in term premia, as well as a higher expected path for Bank Rate. The 10-year gilt yield peaks at 6.9% at the beginning of 2020, before falling back to around 4.5% by the end of the scenario.

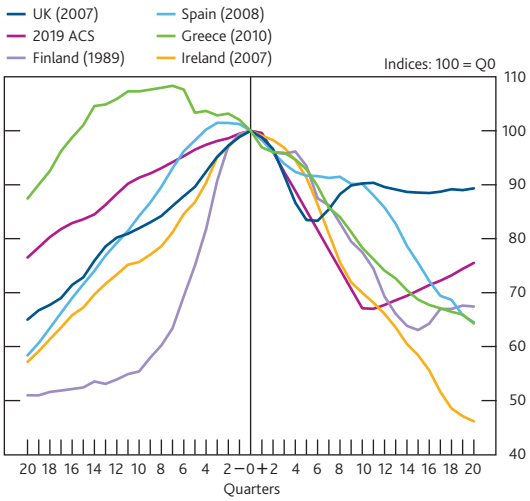
Banks' **wholesale funding spreads** also rise materially, and this spills over into retail funding costs as well. For example, five-year senior unsecured bond yields rise by more than 2 percentage points relative to risk-free rates over the first year of the stress, before falling back.

As the economy weakens, nominal household income and corporate profits fall, contracting by 3.4% and 6.5% respectively in the first year of the stress. Consistent with that, the stock of retail deposits grows more slowly than in the baseline scenario.

Property prices also fall. UK residential property prices fall by 33%, exacerbated by a withdrawal of buy-to-let investors. This stress is more severe than that experienced by the United Kingdom during the global financial crisis, but is comparable with a number of past severe housing market downturns in other advanced economies (**Chart 15**). In the stress scenario, the falls are more pronounced in those regions of the United Kingdom which have seen more rapid house price rises over recent years. Similarly, a pull back by overseas investors contributes to the pronounced fall in CRE prices in the scenario. In aggregate, UK CRE prices fall by 41% from peak to trough, with the fall greater in the prime CRE sector.

Chart 15 The UK house price fall in the 2019 ACS is comparable with past international episodes

Residual property price falls in the 2019 ACS and past international episodes



Sources: Bank of England, Halifax, Nationwide, OECD and Bank calculations.

Next steps in stress testing

In October 2018, the Bank announced it had decided to delay the launch of the 2019 biennial exploratory scenario (BES) to September 2019. It remains the Bank's intention to launch the 2019 BES in the autumn with a release date of October 2019 currently envisaged. Information on the content of the 2019 BES will be published later in the year.

The Bank will also publish its updated 'Approach to stress testing' document later in 2019. This will set out the main features of the Bank's stress-testing framework beyond 2019. The updated approach will be shaped by the findings of the review of stress testing, which is currently being conducted by the Bank's Independent Evaluation Office.

(13) For further details of how global shocks affect the UK economy see Chowla, S, Quaglietti, L and Rachel, Ł (2014), 'How have world shocks affected the UK economy?', *Bank of England Quarterly Bulletin*, 2014 Q2; and Gilhooly, R, Han, J, Lloyd, S, Reynolds, N and Young, D (2018), 'From the Middle Kingdom to the United Kingdom: spillovers from China', *Bank of England Quarterly Bulletin*, 2018 Q2.

Glossary

ACS – annual cyclical scenario.
BES – biennial exploratory scenario.
CCyB – countercyclical capital buffer.
CET1 – common equity Tier 1.
CRE – commercial real estate.
EBITDA – earnings before interest, taxes, depreciation and amortisation.
EME – emerging market economy.
ERI – exchange rate index.
FPC – Financial Policy Committee.
GDP – gross domestic product.
Hibor – Hong Kong interbank offered rate.
IFRS 9 – International Financial Reporting Standard 9.
IMF – International Monetary Fund.
Libor – London interbank offered rate.
MPC – Monetary Policy Committee.
OECD – Organisation for Economic Co-operation and Development.
ONS – Office for National Statistics.
PNFC – private non-financial corporation.
PRA – Prudential Regulation Authority.
PRC – Prudential Regulation Committee.
RWA – risk-weighted asset.
SRB – Systemic risk buffer.
VIX – CBOE Volatility Index.
WEO – IMF *World Economic Outlook*.